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AMC PAMPHLET
AMC 385-65

SAFETY DIGEST

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U.S. ARMY MATERIEL COMMAND

ARMY SAFETY POLICY

THE SAFETY POLICY OF THE ARMY IS TO REDUCE AND KEEP TO A MINIMUM ACCIDENTAL MANPOWER AND MONETARY LOSSES, THUS PROVIDING MORE EFFICIENT UTILIZATION OF RESOURCES AND ADVANCING THE COMBAT EFFECTIVENESS OF THE ARMY. AR 385-10

What can you and I do to promote the safety policy of the Army? There is no simple solution available, but one thing all of us can do to reduce accidents is to become "safety-conscious." Let reason and mind prevail over fear and emotion.

J. C. LAMBERT
Maj. General, USA
The Adjutant General

HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D. C. 20315

AMC Pamphlet
385-65

May 1965

The Safety Digest is an AMC Pamphlet prepared by the Safety Division, Headquarters, U. S. Army Materiel Command. Its purpose is to disseminate information which can materially influence and improve safety programs at all Command establishments.

Articles are included to supplement technical knowledge as well as practical knowledge gained through experience. They provide a basis for the further refinement of safety measures already incorporated in operating procedures and process layout. To achieve maximum effectiveness, the Safety Digest should be given widespread circulation at each AMC establishment.

Articles appearing in the Safety Digest are unclassified and are not copyrighted. They may be reproduced as desired in order to bring pertinent accident prevention information to the attention of all employees. The Army Materiel Command Safety Digest should be given a credit line when articles are extracted.

Unclassified material believed to be of interest or benefit to other establishments is welcome for publication in the Safety Digest. Please send articles for review to: U. S. Army Materiel Command Field Safety Agency, Charlestown, Indiana. If possible, include pictures, charts, drawings, and illustrations that clarify and heighten interest in your presentation.

SELWYN D. SMITH, JR.
Major General, USA
Chief of Staff

OFFICIAL:

STANLEY J. SAWICKI
Colonel, GS
Chief, Administrative Office

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STATEMENTS BY THE PRESIDENT

MISSION "SAFETY-70"

MEMORANDUM FOR THE HEADS OF
EXECUTIVE DEPARTMENTS AND AGENCIES

The reduction of waste in manpower and materials is one of the principal managerial aims of this Administration. That the savings from such a program be applied to advance needed services is one of the keynotes of the public policy of this Administration.

There is a great opportunity to make a significant reduction in that most senseless kind of waste--the loss of human lives through accident--and at the same time save many millions of dollars.

Secretary of Labor W. Willard Wirtz has informed me that in 1963, the latest data available, there were 190 deaths and 41,905 disabling injuries among Federal workers, at a cost to the Government of $37,600,000.

In just the last seven years:

More than 1,200 Federal workers died from job injuries.

Nearly 300,000 sustained disabling injuries.

Over 18.5 million man-days of potential production were lost.

Costs to the Federal Government amounted to $1 1/4 billion.

Nearly all of these deaths and injuries can be prevented.

I intend to see to it that the Federal Government will do everything in its power to prevent them.

I have initiated today Mission SAFETY 70--a new, practical safety effort designed to reduce Federal work injuries and costs, year by year, until a total 30 percent reduction is achieved by 1970.

This will result in the saving of approximately 200 lives.

It will prevent nearly 45,000 disabling work injuries.

It will save the Federal Government nearly $250 million in costs.

Savings such as these, once made, extend over many years.

I am forwarding with this memorandum a copy of the Safety Policy for the Federal Service. In accordance with this Policy, I am asking you to review realistically and revise where necessary the safety program of your Department or agency and report to me within 90 days the results of your review.

I am also requesting the Secretary of Labor to advise me periodically, pursuant to his responsibilities under law and Executive Order 10990, of the progress achieved.

The cost of this effort in interest, energy and time is small indeed when compared to the great benefits that can be gained. I am looking forward to prompt and continued progress in reducing this needless waste of lives and materials.

Lyndon B. Johnson

★ A SAFETY POLICY FOR THE FEDERAL SERVICE

It is the policy of the Federal Government to so administer its programs that each employee works in safe and healthful conditions, free from accidents.

Americans have always placed the highest value on human life, in accord with our concept of the worth of every individual. As the public repository of our social ideals, government has a direct obligation to express our regard for human life in every measure necessary to safeguard and protect it.

Americans also place a high value on efficiency and economy. As this country's largest single employer, the Federal Government has a continuing duty to prevent needless waste.

The policy of this Government, then, is both humanitarian and practical.

It safeguards and conserves manpower.

It reduces the cost of injuries and eliminates the waste of materials.

It is a basic element in sound and prudent management.

I am not unmindful of the progress achieved by many Federal agencies in the prevention of accidents.

Yet, while much has been accomplished, much remains to be done.

There remain wide disparities in safety performance among agencies. This disparity can be eliminated if each agency will administer its safety program in accordance with the needs to be met and the hazards that are encountered. Often the most dangerous occupations have the best safety records.

Further improvement in the safety record of individual agencies as well as of the Federal Government as a whole must be attained.

Accordingly, I request the heads of all departments and agencies to review carefully and critically their safety policies and programs. Constant vigilance, effective action, and sustained effort for improved performance are required. Executive and supervisory leadership must be provided. The cooperation and support of employee organizations is essential. Each Federal worker must likewise seek constantly to avoid accidents to himself and others.

Our objective is the fullest protection for our civilian and military personnel on and off duty and for all who visit Federal buildings, installations, parks, forests and other facilities. To advance these goals the Federal Government will cooperate with State and local governments, management, labor, and safety organizations in developing and applying safety standards responsive to changing conditions and the pace of technological progress.

Each department and agency head shall take appropriate steps to implement this directive on a continuing basis. The Secretary of Labor to the extent feasible will provide assistance through the Federal Safety Council and its field councils. He will also keep me advised of each agency's progress.

The toll of injuries and the cost of accidents must be reduced again and again.

LYNDON B. JOHNSON

HIGHWAY SAFETY ACTION PROGRAM

President Johnson issued the following statement, following receipt of a report from The President's Committee for Traffic Safety, summarizing performance by States and communities in applying the Highway Safety Action Program:

"The record-breaking motor vehicle travel accompanying the Nation's high level of prosperity has increased the need for stepped-up activity to curb traffic accidents.

"It is self-evident that we must expand and intensify our efforts to prevent these accidents.

"Toward that end, it is indispensable that we initiate greater research into the causes and means of preventing accidents.

"We need the active participation of the best minds in the colleges and universities in all of our States. We need to enlist researchers in all of the sciences: medicine, law, engineering, psychology, public information -- every field that can help us to learn more about human behavior, and to develop new means of increasing the safety of highways and vehicles.

"I am asking the Committee to report back to me as soon as it can as to the current status of traffic safety research in these fields, and what should be done to stimulate broader activity.

"This is not to say that our present efforts have been fruitless. With the explosive traffic growth, our plight would be far worse had it not been for diligent safety activities.

"Primary responsibility rests in our States, counties, and municipalities; and the Committee's report makes evident that improved performance, overall, has been attained.

"The Federal Government and the Congress have cooperated, also, in many ways. A notable example is the National System of Interstate and Defense Highways, with its many safety features.

"The Committee for Traffic Safety has given leadership in stimulating State and community application of the tested and proved accident prevention measures of the Action Program.

"Greater understanding of this Program has been developed through national and regional conferences of legislators, public officials, and citizen leaders -- both men and women.

"The Committee's projects are conducted through its Advisory Council of national, non-profit organizations of public officials and private interests, and Federal agencies.

"Nevertheless, our combined efforts clearly fall far short of our requirements. There is urgent need to apply the entire Action Program more vigorously through day-after-day cooperation of private citizens and public officials. There is need for more technical assistance to these officials from national traffic safety service organizations.

"These and many other needs must be met so we may deal more effectively with our critical traffic accident problem. We cannot accept the intolerable drain on our human and economic resources that these accidents are causing."

The President's Committee consists of 18 citizen members, appointed by the President; plus, ex-officio, the Secretaries of Commerce, Defense, Labor, and Health, Education and Welfare. Chairman is W. R. Hearst, Jr.

PROGRAM FOR PERFECTION

● ZERO ACCIDENTS - ZERO DEFECTS

Frank Bryant, Plant Manager
Harvey Aluminum Sales
Milan Army Ammunition Plant

At the Milan Army Ammunition Plant we are striving for perfection in two of the most important elements in the accomplishment of our mission, safety and quality. I call these the most important elements, because if we can have zero accidents and zero defects matters such as production and cost reduction will automatically benefit.

The viewgraph (see photo) shows our simple formula. When the ingredients of zero accidents and zero defects are combined, the result is an invigorating brew we call Efficient Operation. Seven of these pictures painted in eye-catching color on four-foot square backgrounds are strategically located throughout our plant where each day each employee will see one of them and be reminded of our theme, "It Depends on You".

Each employee must strive for perfection in the accómplishment of his particular job. This includes working in a safe manner. The sum of these individual attainments of perfection is zero accidents and zero defects. With the right employee motivation, we are convinced that these ambitious goals will be achieved at a real saving in cost.

I think that a unique thing about our application of the regular zero defect program is our incorporation in it of zero accidents. We feel that those two items are inseparable.

While the program is plant-wide, I would like to outline the procedures used to implement the part that concerns preparation, assembly, inspection and packing of ammunition on the production assembly lines:

Defect Determination

1. Quality defects are determined by a quality assurance and/or Army inspector during normal inspection of samples. All classes of defects are considered together simply as defects.

2. Safety deviations identified by approved auditors are classified as safety defects.

a. A safety deviation or defect is defined as a departure from an approved operational procedure.

b. Injuries are automatically classed as a safety defect.

Data Presentation

1. Station or Group Presentation

Daily presentation of progress toward zero defects is shown on a board located in a prominent position within the portion of the belt covered by a sampling station. The board has two headings, one Quality and the other Safety. Each board is posted at the end of the shift by the building foreman in charge of the operation. The number of days the current status has existed is posted underneath each Quality and Safety heading. The day's progress is indicated under each heading as follows:

a. If no defects are found, an erect figure of "Mr. Zero" with a smug expression on his face is posted.

b. If a defect is found, a figure of "Mr. Zero" in a fallen position with an expression of depression on his face is posted.

2. Line Presentation

Progress of the whole operating line toward zero defects is represented by a figure of "Mr. Zero" striking a spring with a hammer to propel a ball upward toward an area marked "PERFECTION". The height of the ball depends on the total number of stations which operate without a defect. This board is located in the cafeteria and is posted at the end of each shift.

The zero defects program was initiated on the lines on the 1st of December 1964. Our zero defects results are surpassing our best previous efforts. During the first two calendar weeks the program was in effect, Cartridge 81mm, M362A1; Cartridge, 40mm, M406 and M407E3; and the CBU-1A/A were produced without a single defect being found. During the same period only one major and one minor defect were found on the CBU-2A/A. This record includes the results of both the contractor inspection and the Army inspection.

The Milan Army Ammunition Plant uses vu-graphs to remind its personnel of its formula for efficient operations. Shown with the formula are Mr. Frank Bryant, Plant Manager for Harvey Aluminum Sales, and Captain R. R. Smith, Commanding Officer.

● ELECTRONIC PROVING GROUND WORKS FOR DRIVER SAFETY

At the U. S. Army Electronic Proving Ground, Fort Huachuca, safety begins in the transportation motor pools and at the driving school for Army drivers. This safety consciousness also reaches out to operators of privately-owned autos in an effort to eliminate death on the roads and reduce property damage. The main target in this area is unmarried, younger soldiers who make up the largest percentage of the post population.

The post driving school employs 12 LINK trainers to instill safe driving habits in vehicle operators. To qualify for a driver's permit, military and civilians alike must take their turn at the trainer. They must also study Army and Arizona driving regulations. Desert and mountain driving are stressed.

The school is open to individuals undergoing normal driver training on post, to remedial drivers cited for poor driving habits, and to military personnel and dependents under 25 who try for the reduced insurance rates offered driver trainees.

Before being allowed to depart Fort Huachuca on leave Army personnel are required to have their vehicles inspected at the transportation motor pool. If the car is safe, the soldier can leave. If it is unsafe, he stays until the deficiencies are corrected.

Another restriction placed on personnel taking leave is the departure time. Soldiers are not allowed to depart in the late afternoon or at night. Fort Huachuca commanders want them thoroughly rested before starting their trips.

Mileage is taken into account in granting leave. The commander determines the reasonable driving time to the leave address and return. Adding this to the days desired "at home", the total leave period is ascertained.

The soldier's commander writes to the next of kin to be visited, advising him of the estimated time of arrival and the day the soldier should depart on the return trip. The relative is urged to encourage the soldier to observe the mileage-time element as well as safe driving practices on the return trip. Many letters of thanks have been received from soldiers' parents.

This year Fort Huachuca soldiers must undergo a three-hour orientation with LINK trainer before holiday leave can be granted. This is still another trick of the ever-growing safety trade at the U. S. Army Electronic Proving Ground.

These techniques are proving their effectiveness by keeping Fort Huachuca's personnel off the highway death roster.

At Fort Huachuca privately-owned vehicles are inspected at the transportation motor pool before Army personnel depart on leave. Any deficiency that makes the vehicle unsafe must be corrected before the soldier leaves the post.

● DANGEROUS GREASE FITTING ON TRACTORS

The need to replace the old and dangerous grease fitting (near the track ram) on D-8 and D-9 Caterpillar tractors (built between 1956 and 1960) was emphasized by the recent accidental death of a non-Army foreman.

A mechanic turned the pressure-relieving stud to take the strain off the track. The stud discharged like a rifle bullet, striking a foreman in his eye socket and killing him instantly.

The Mobility Command has modification kits on hand to correct the problem. Records indicate 120 tractors are still unmodified. The following Fact Sheet shows information available for DA equipment. Users of D-8 and D-9 tractors should verify that the new fitting has been installed, or obtain the modification kit to correct the deficiency.

FACT SHEET

D-8, D-9 Caterpillar Tractors
Purchased Between the Years 1956 and 1960

1. Department of the Army purchased 600 D-8's in 1958. Number still in use by DA unknown. Some may have been transferred to Army Reserve, National Guard, etc.

2. MWO 5-2410-204-35/1, dated 28 March 1961, (TM 5-2410-204) covered modification.

3. Six hundred kits were delivered to the Army by the Caterpillar Company. All were distributed to Army installations involved. An additional 104 kits were received by the Army. Eighty-five kits are in storage. Records indicate 120 tractors are still unmodified.

4. TB 750-9321, indicating the serial numbers of the D-8's that have not been recorded as completed, has been sent to TAG for printing. The MWO will be rescinded effective 31 March 1965 when TB is published.

5. MWOs have been published on International Harvestor tractors with same conditions. Series numbers of these tractors are;

TD 18-(182) MWO 5-2410-203-35/1 dated April 1962.

TD 20-(200) MWO 5-2410-200-35/1 dated January 1962.

TD 24-(241) MWO 5-2410-205-35/1 dated January 1962.

Records indicate modifications on IHC tractors have been completed.

SAFETY HAT "DON'TS"

DON'T use a safety hat for a lunchtime stool. The hat is engineered to protect the head not the bottom, and was not intended to replace chairs.

DON'T bore ventilating holes in the crown. The design of the hat provides for air circulation.

DON'T trim the brim.

DON'T use a safety hat or cap for a football.

DON'T throw safety hats into a truck or toolbox. It is better to suspend them in racks which will not subject them to abuse.

DON'T cut or remove suspension straps. A hat with improperly worn or designed suspension straps, or inadequate suspension space, cannot protect the head properly.

● FAST-ACTING DELUGE SYSTEMS

James Harvey
Chief, Fire Protection & Prevention Branch
Frankford Arsenal

Frankford Arsenal has developed two quick actuating fire protection devices capable of controlling fires involving rapid burning materials--particularly, in the field of explosives. One that is used is capable of actuating a deluge nozzle, deluge valve or carbon dioxide release mechanism in one-eighth of a second. Complete extinguishment of the propellant can be accomplished in less than one-half second.

The principles involved in the operation of this deluge device are applicable to the release of any type of extinguishing agent that can be accomplished by the use of a weight-release mechanism that operates on an increase in air pressure. The weight-release mechanism in combination with the deluge nozzle and heat actuated devices (shown within dashed lines on the sketch) have been used at Frankford Arsenal for many years. The addition of the electronic actuator has decreased the response time from several seconds to one-eighth of a second.

This system is designed to be fail-safe. If the electronic actuator should fail to operate for any reason, the heat-actuated device will trip the device.

The electronic actuator consists of a light-sensitive switch, or switches, used to operate a modified Agastat. The operation of the Agastat provides a momentary increase in air pressure--sufficient to trip the weight-release mechanism. The light switch is so designed that it does not respond to ambient light but will conduct instantly upon a flash or flare from a fire. One or more light-sensitive switches may be used in parallel so that any one of them will operate the weight-release mechanism. Two light-sensitive switches may be wired in series (see sketch) if the possibility of actuation by a strong foreign light source exists in a particular area.

The second system is an extremely fast actuating device capable of extinguishing fires in incendiary and tracer mixtures. This system actuates in 18 milliseconds, with complete extinguishment of an incendiary composition in 71 milliseconds. The total time from ignition of this mixture to complete extinguishment was one-fourteenth of a second. Further development of this device is under way with the probability that the time necessary to actuate will be reduced to two or three milliseconds.

ELECTRONIC ACTUATOR FOR FIRE PROTECTION SYSTEMS

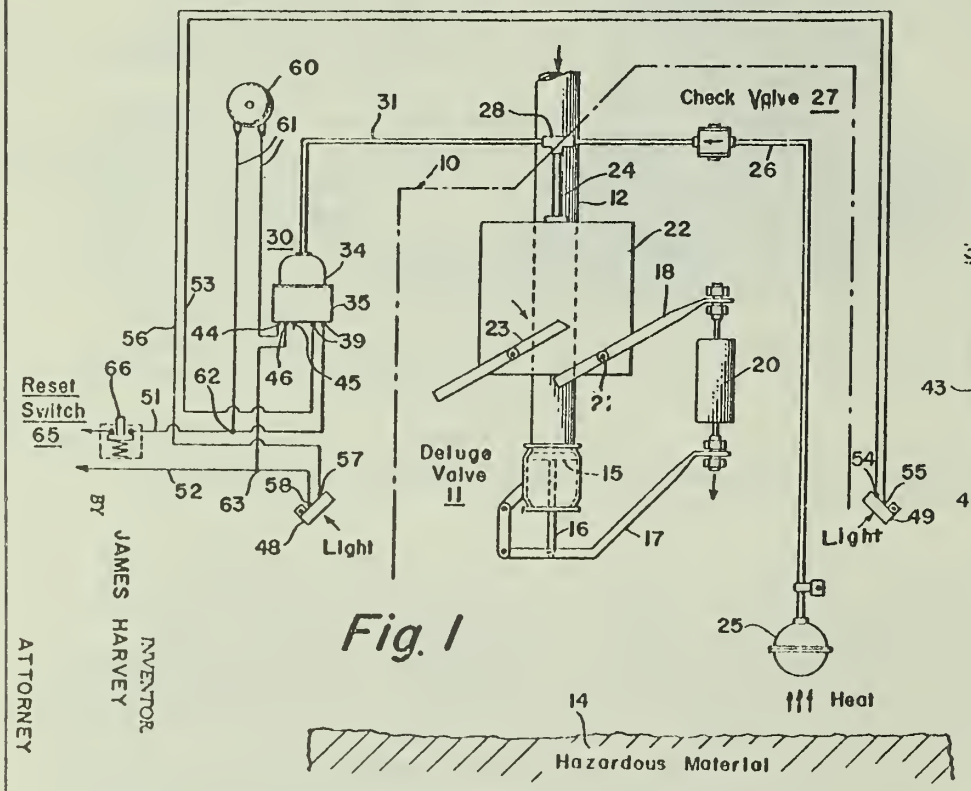

Fig. 1

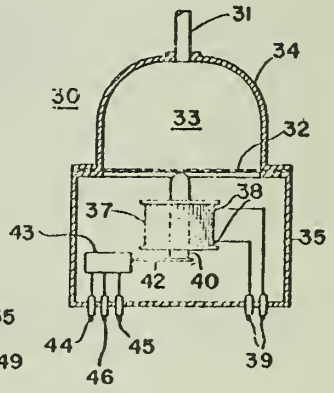

Fig. 2

BY JAMES HARVEY INVENTOR

ATTORNEY

NOTE: The numbers on the accompanying sketch of the device invented by Mr. Harvey are references to the patent disclosure description of the device. The light-sensitive switches are shown as #48 and #49. The modified Agastat is shown as #30, with an external alarm device as #60.

CURRENT EVENTS

● UNREPORTED MINOR INJURY HOSPITALIZES WORKER

The employee was on his way to another building to pick up a report. He mounted a bicycle and started to turn it around. As he turned he lost his balance, and he and the bicycle fell to the concrete pavement. Shaken, but apparently not disabled by the fall, he disentangled himself from the bicycle, rose, remounted it and completed his errand. He did not report the fall.

Ten days later the man reported a swollen leg, and his supervisor received his first information about the accident. The employee was examined and sent to a hospital for observation. Injury to his knee and a secondary infection kept him away from work for ten days. The inference reached by post medical authorities was that a minor injury had been aggravated into a disabling injury because a concussion and abrasion had not been reported and treated the day the accident occurred.

The supervisor instituted tighter control over the use of bicycles and other wheeled equipment. Training was provided personnel and only those qualified were permitted to operate the equipment.

● REVERSED LATHE SHAFT SPINS OFF LOCKING PIN

A speed lathe was moved from one shop into another, and an employee was assigned to operate it. The rotational switch was set for the shaft to rotate in a clockwise direction with a maximum speed of 1,750 rpm. The worker started the machine and operated it for four hours. He then shut it down for a few minutes while he took a break.

When he returned, he attached to the plate an aircraft engine piston he intended to polish. He inserted the locking pin, tightened the locking screw, and started the lathe with the hand lever. Soon after the machine started, it hurled a piece of metal into the man's face. His chin was lacerated, and he lost one day from work.

The supervisor who investigated the accident found that the employee had been struck by the locking pin he had inserted just before starting the lathe. Instead of the shaft turning in a clockwise direction, as the worker expected it to do, it had turned counterclockwise. This reverse motion loosened the locking nut and permitted the locking pin to be hurled off by the high speed of the shaft. It was discovered that movement of an electrical switch on the machine had changed the rotational direction of the shaft from clockwise to counterclockwise.

Corrective measures to prevent similar accidents included the following:

The switch handle that could change the shaft rotational direction was eliminated from this and the other speed lathes at the installation. Cover plates were installed to prevent unexpected changes of the direction of shaft rotation. Clockwise rotation only was possible after the change was made.

An engineering revision to guard rotating parts on the machine was initiated.

A policy was adopted of thoroughly checking all new power equipment for safety factors and preparing and posting standing operating procedures.

● LADDER SCAFFOLD PERMITS FALL

The workman was preparing to paint the side of a boiler. The space available for this particular job was too cramped to permit the erection of the 5' X 5' cross-section metal scaffolding that was ordinarily used for most work in the boiler house. The employee therefore followed a 12-year practice of improvising a platform from two 2" X 6" planks supported by the steps of two metal stepladders.

After he mounted his narrow platform five feet ten inches above the floor, he found he needed to climb six inches higher to check the need for paint scraping. He climbed upon an I-beam ledge on the boiler, made his inspection and stepped back toward the platform. As he descended, he grasped a soot-blower bracket for additional support. The bracket was a part of the equipment that was being repaired and it was loose on its shaft. It came off in the man's hand, causing him to lose his balance and his footing. He fell backward from the platform and landed against a boiler fuel pump. Four ribs on his left side were fractured and he was unable to return to work for several days.

To prevent similar accidents to workmen in close quarters, the installation purchased a narrow metal scaffold that had a guard rail. Employees were instructed to use only approved scaffolding of proper height, to remain on the scaffolding when they were working, and to check the adequacy of their handhold whenever they were climbing or seeking support.

FINGER FOLLOWS CAN INTO CUTTER

An apprentice machinist was milling a keyslot in a piece of aluminum with a plain milling cutter.

The cutting lubricant in the machine was not the correct type for use with the metal, and the apprentice used a five-inch straight-spouted oilcan to apply an aluminum lubricant to the cutter and the metal. The lubricant was squirted at the cutting tool in-running nip point while the machine was operated. The cutter operated at a speed of 250 rpm and had a feed of one-half inch per minute.

The fast-running cutter caught the can. Before the man could release the can his hand was pulled into the cutter. His right index finger was amputated at its first joint.

The supervisor took action to prevent similar accidents. A spout type container was mounted on the machine to drip feed aluminum lubricant on to the cutter. Unneeded oil cans were removed. All personnel were instructed to keep can spouts, brushes and other items away from the in-running cutting tool nip point of machines that were being operated.

● REPORTED DEFECT PLUS ACCIDENT DEADLINES TRUCK

The transmission of the 1/4-ton truck was in such poor shape that second gear would not stay engaged. The condition had been properly reported, but the vehicle had not been deadlined for repairs.

A young soldier, accompanied by a second enlisted man, was assigned to operate the vehicle. His route of travel included a right turn, and after proceeding a short distance, a left turn into a branch road.

As he approached the first turn the soldier slowed the truck and shifted into second. A bus was approaching from his left, but it seemed to be a safe distance away. He made his right turn and then moved into the center of the road, preparing to turn left into the branch road. The second gear became disengaged. Busy with one hand on the steering wheel and the other on the gear shift, the soldier failed to keep the bus in view and to signal his intent to make a left turn. The bus, much closer than he realized, overtook him and started to pass on the left. The bus struck the left rear corner of the truck.

The truck driver and his passenger had their seat belts fastened and were not injured. Damage to the two vehicles amounted to $336. The truck was deadlined for repair of the defective transmission and the crash damage.

The accident was made the subject of an orientation of drivers on safe driving practices. Emphasis was placed on the requirement that vehicles with mechanical defects were to be deadlined immediately for repair.

● OFFICE SAFETY?---IT'S UP TO YOU!

S. J. Ryan, Senior Engineer
Lone Star Division, Day & Zimmermann, Inc.
Lone Star Army Ammunition Plant

How often do you walk an obstacle course in your office?

In most cases it is the little obstacles that cause office accidents. These take such forms as open desk drawers, open file drawers, highly waxed floors, misused stools, loose telephone cords, unrepaired furniture, protrusions from the floor, and liquids on the floor.

How do these obstacles get there? Directly or indirectly you cause them. You leave desk or file drawers open, spill liquids on the floor and stand on stools. These accident-causing conditions result from careless acts of individuals.

What can you do to prevent office injuries? To begin with, convince yourself that safety is serious business and that it is worth all you can contribute to achieve safe working conditions. Then think, before you act, every time you act.

Remove all obstacles you can find. Shut that desk or file drawer after you open it. Use the furniture correctly. Report floors that are too slick. See to it that spilled coffee or other liquids are removed from the floor.

Does all this impress you as being so obvious that it borders on the ridiculous? It is not. Office workers who ignore these and similar obvious obstacles are frequently injured. Their injuries are often both painful and disabling.

Keep office safety in mind day after day. Act to remove the little obstacles and prevent most office accidents.

● BATTERY BOOSTER PROCEDURE

(Editors Note: Recently a truck battery explosion occurred when a charge was given by booster cable from a battery in an adjoining truck. The weather was extremely cold and the battery was frozen. MOCOM supplied the following safe procedures to be followed when frozen or dead batteries are involved.)

1. Remove frozen or dead battery from vehicle and replace with a fully charged battery.

2. Wear safety goggles or face shield when handling any battery.

3. Wear gloves to prevent possible acid burns.

4. No attempt will be made to apply a booster charge except under most extreme emergency circumstances, where no replacement battery is available and the equipment must be used. Never attempt to boost a frozen battery.

5. To prevent a static discharge, ground the cold vehicle or equipment.

6. Cautions: a. The clamps on each end of one of the jumper cables must be painted red to reduce the probability of an error in connecting the terminals of the cold vehicle to those of the hot vehicle. Cables should be connected positive-to-positive and negative-to-negative only. If terminals are not marked + or - they can be identified by size as the positive terminal is slightly larger (11/16" diameter) at the top than the negative terminal (5/8" diameter). The connection of positive (+) to negative (-) presents another source of explosion.

b. Inspect vent openings to assure that vent caps on top of cold battery are not plugged by foreign material (dirt, frozen, etc.). Loosen caps slightly.

c. Hook both jumper cables to the battery of the cold vehicle first, attaching the clamp of the jumper cable to the grounded side of the battery first then connect the other jumper clamp to the positive side of the cold battery.

d. Hook the clamps on the opposite ends of the jumper to the hot vehicle, attaching the ground cable to the grounded terminal of the hot battery first.

(e) In disconnecting jumper cables, after the cold vehicle has started or failed to start, disconnect the clamp from the grounded side of the hot battery first, then disconnect the clamp from the positive side of the hot vehicle.

(f) Disconnect the clamp from ground terminal of the cold vehicle then the clamp from the positive terminal of the cold vehicle.

Note: No smoking or open lights should be permitted near the equipment when attempting to start by the use of "Jumpers".

Care should be taken not to touch any metal parts of either vehicle with the jumper clamps when connecting or disconnecting "Jumper" cables.

Stay clear of the cold vehicle while jump operation is in progress.

The electrolite of a battery in various stages of charge will start to freeze at temperatures indicated below. The given temperatures indicate the approximate points at which the first ice crystals begin to appear in the solution. The solution does not freeze solid until a lower temperature is reached. Solid freezing of the electrolite may crack the container and damage the positive plates. A 3/4-charged battery is in no danger of damage from freezing. Therefore, keep batteries better than 3/4-charged, especially during the winter weather.

Specific Gravity (Corrected to 80°F)	Freezing Temperature Degrees Fahrenheit
1.280	-90°F
1.250	-62°F
1.200	-16°F
1.150	+ 5°F
1.100	+19°F

● TESTING TO ASSURE PROTECTION

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Supervisory Safety Engineer
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The Redstone Arsenal Research Division of the Rohm and Haas Company has a mission for the development of new propellants, particularly those having higher impulses, that require the use of new highly energetic chemical compounds. Remotely controlled facilities are used for mixing, casting, and curing of these experimental propellants.

Before they were put into operation these facilities were tested to make certain that the safety factors engineered into them were sufficient to provide adequate protection for personnel and to prevent blast and shrapnel damage to nearby equipment within the operating bay. One test, to determine the capabilities of a shield for protection of an operator from the detonation of one pound of Composition C-4 (more than twice the proposed working limit of 200 grams) within a 12-inch reinforced concrete wall, is described below.

A semicylindrical shield of 1/2-inch mild steel was erected for the safe mixing and casting of small batches of novel propellant with undetermined explosive properties. The shield was mounted on an independent concrete and steel beam base in one wall of a concrete block building, but clear from the adjacent walls and ceiling by at least a foot (Photo No. 1). It was 6 feet in diameter and about 8 feet high with the open side facing out. It contained a flange-mounted window, glazed with two 2-inch panes of Plexiglas with a 2-inch separation between them. At a level above the window were two 8-inch diameter ports for accommodation of remote manipulators. One of these ports was closed with a steel plate for test purposes. The shield was reinforced with beams binding it on the outside periphery and cross beams within to support the working surface. Steel floor and ceiling plates were continuously welded to the shield walls.

The one-pound charge was mounted before the window, 10 inches from the inner pane, as shown in Photo No. 2. It was initiated by a No. 8 electric blasting cap.

The explosion destroyed the plywood "table" and shattered the inner windowpane. It caused no damage to the shield itself apart from loosening a few of the base-mounted bolts.

Glassware standing near the shield on the operator's side was not even knocked over. However, the blast and its accompanying rarefaction wave did cause extensive superficial damage to the building. The 1/4-inch Transite ceiling was pulled inward and several pieces were torn free. Overhead ventilator grids opposite the shield were forced in, and double swing doors on the opposite wall from the shield were blown open and buckled slightly. The door in the wall common to the shield suffered a loosened Plexiglas window and a broken Transite panel (Photo No. 3). The transite lining the eaves over the shield was destroyed. The steel plate in one of the manipulator access ports was pulled into the shield (it was unsupported on this side) but by its failure to be ejected into the room it gave evidence that flange would successfully retain the manipulator.

An operator probably would have been knocked down by the concussion. Whether he would have been blown through the doors or pushed against the shield by secondary effects could not be determined.

The shield was not found to be adequate when high velocity shrapnel-like fragments were produced. In a test with one pound of C-4 in a 2-inch water pipe, 1/2-inch thick 12" X 12" mild steel plates were located 10 and 18 inches from the charge. A duplicate of the double Plexiglas window was suspended 10 inches away. Fragments produced by detonation of the charge perforated both steel plates and demolished both panes of Plexiglas.

In a repetition of the experiment with one-inch thick steel plates and 3-inch thick aluminum plates (equaling the steel in mass per unit cross sectional area) none of the plates were perforated at either 10 or 18 inches. The steel plates showed slight pimpling on their back sides.

These results demonstrated that additional shielding or barriers must be provided if handling of heavily confined materials was to be undertaken.

Editor's Note: A November, 1963, Safety Digest article, "Special Equipment for Propellant Development", described the remotely controlled equipment Rohm and Haas Company uses for mixing, casting, and curing experimental propellants.

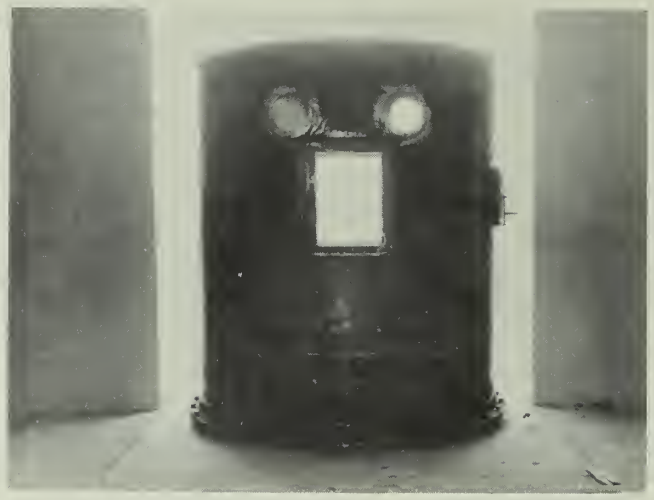

Photo 1

Photo 2

Photo 3

Photos 1 and 2 show front and back views, respectively, of the 1/2-inch mild steel shield before it was tested by detonation of a one-pound charge of C-4 in glass above a wooden "table".

Photo 3. The "table" was blown out and the adjacent area of the building showed damage from the blast and its accompanying rarefaction wave. The shield was not seriously damaged. A later test with one pound of C-4 in a 2-inch water pipe showed the shield would not provide adequate protection from high velocity shrapnel-like fragments.

● ROUGH HANDLING DOES CAUSE EXPLOSIONS

Analysis of accidents that have occurred at AMC installations suggests that safe handling of explosive items is not being emphasized sufficiently during the training of new operators, or during day-to-day operations. In addition, it appears that safe handling is not always given adequate attention in the layout of explosives equipment and operations, and the formulation of methods and procedures.

The accident described below supports these conclusions.

Operations involving demilitarization of propellant charges for the 4.7-inch, 120mm gun, M1, were being conducted in an operating building.

Rounds containing the charges were packed in wooden boxes. One step of the demilitarization process called for an operator to remove the rounds from the packing boxes and to place them on a worktable. The packing boxes were positioned on two lengths of gravity roller conveyor which were supported by empty wooden boxes. To gain additional height for pulling the charges out of the packing boxes, the operator stood on a 4' X 4' double-faced wooden pallet which was located on the floor between the gravity roller conveyor and the worktable (photo 1).

Two propellant charge fiber containers and a cardboard filler were packed tightly in each box. The acid-proof paint on the fiber containers caused some containers to stick together, requiring the operator to use a bar to loosen them prior to removal.

The operator anticipated difficulty in removing containers from one of the boxes, so he raised his left foot and braced it against the gravity roller conveyor in order to gain leverage. The container came out of the packing box easily, causing the operator to lose his balance. The container slipped from his grasp and fell approximately 36 inches. At that point it struck the exposed end of the locking hook of the gravity roller conveyor. The locking hook penetrated the end of the fiber container and the felt cushion inside striking the M1B1A2 percussion primer in the manner of a firing pin (photos 2 and 3). The primer functioned and ignited the black powder igniter charge. Approximately three pounds-four ounces of the propellant burned before the charge exploded. Unburned propellant and fragments of the fiber container and cartridge

cases were scattered over the entire work area and outside the building (photo 4). The operator received lacerations and fractures of the right foot and burns over his entire body. Fragments inflicted first-aid injuries upon four other operators working in the room.

Corrective action for prevention of recurrence included the redesign and relocation of the conveyor projection and additional training of explosive operators, with emphasis on safe handling.

Photo 1 - This photograph shows the scene of an explosion that injured five men. One man stood on the wooden platform, braced his left foot against a conveyor roller (left center) and pulled a 120mm-round from the box at the upper left. The container slipped from his hands, and its end struck and was penetrated by the locking hook of the conveyor beside his foot.

Photo 2 - The conveyor locking hook penetrated the container and the felt liner and acted as a firing pin when it struck the round's percussion primer.

Photo 3 - The metal end and the felt liner of the propellant charge container are shown on the conveyor locking hook which penetrated them.

Photo 4 - Unburned propellant and fiber, and fragments of the charge and its container, littered the work area. The worker who dropped the charge received disabling injuries. Four fellow workers suffered first aid injuries.

● UNDERSTANDING SOLVENT HAZARDS

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Sperry Rand Corporation
Louisiana Army Ammunition Plant

Fires, explosions and toxic atmospheres resulting from the presence of vapors and gases are among the major hazards in industry and in the home. There is need for greater appreciation of these hazards and how to eliminate them. Since the problem is one of environmental control, knowing the properties of the liquids, vapors, and gases being used should be helpful in reducing the hazards.

When flammable substances are mixed with air, they exhibit a lower and an upper limit of flammability. For example, acetylene gas has a wide flammability range of 2.5 to 81 percent, and gasoline has a narrow range of 1.4 to 7.4 percent. These limits may be widened by elevated temperatures, pressure, size and shape of container, and the source and position of the spark. The risk of an explosion is greater when a mixture of gas and air is ignited from below, than when ignited from above. Limits are widened as the diameter of the apparatus is increased, rapidly at first, and then more slowly as the diameter approaches two inches. Processes in which volatiles are used should be carried out below the lower limit.

The flash point is the minimum temperature at which rapid combustion becomes independent of the external supply of heat. The flash point of gasoline is minus 47°F., and its ignition temperature is 536°F. The time period ("lag") at ignition temperature before burning varies over wide limits. For hydrogen gas the time period may be only a fraction of a second, while for ethane it may be 100 seconds.

The vapor pressure of a liquid may be such that at, say, 80°F., its vapor pressure is too low to give flammable mixtures with air. Yet when heated a few degrees above this temperature, it will liberate sufficient vapor to create flammable and toxic mixtures. The explosion hazard may be controlled by regulating the temperature so that the vapor pressure gives atmospheres outside the limits of flammability.

Mineral spirits, naptha, V.M. & P. naptha, Stoddards solvent, and varsol are straight petroleum solvents that usually exhibit a flash point of around 100°F., with relatively low toxic vapors. V.M. & P. naptha is an excellent solvent and thinner for some paints.

In the event these petroleum solvents do not meet the need, or if their degree of flammability cannot be tolerated, the use of chlorinated hydrocarbons should be considered. Chlorine is a member of the halogen family which is made up of fluorine, chlorine, bromine and iodine. The protection of public water supplies through the use of chlorination for bacterial disinfection is common practice. Another beneficial type of water treatment for public supplies is fluoridation.

The degree of flammability of a hydrocarbon is reduced by replacing with halogens one or more of the hydrogen atoms in the compound. Methane gas is highly flammable. When one of its hydrogen atoms is replaced with one atom of chlorine to form methyl chloride, it becomes moderately flammable. Methylene chloride with two hydrogen atoms replaced with two atoms of chlorine is nonflammable in air or in oxygen. Carbon tetrachloride with four atoms of chlorine is not flammable in air or in oxygen; however, it is highly toxic. By addition of the proper proportions of carbon tetrachloride to combustible liquids, such as naptha and petroleum distillates, the resulting mixtures are rendered incombustible. In addition to chlorine, fluorine and bromine may be used in the process. However, upon evaporation, they may become combustible and toxic. Mixing solvents is not a good practice.

Decisions on the use of solvents should be weighed in the balance - flash against toxicity. The technical data sheet furnished by the manufacturer is helpful. Tables of safe distances for various operations involving the use of combustible liquids and vapors have not been developed as adequately as has been done in the manufacture of explosives. Good judgment should be exercised as to what distance is safe for a given operation. If heavy combustible vapors are involved, the elevation should be below that of other operations, so that in case of fire or explosion the liquids and vapors that may be released will not flow toward other buildings.

Chlorothene solvent (1.1.1. tricholoroethane) is a relatively safe chlorinated solvent used for cold cleaning of electric motors.

Dynasol solvent (1.1.1. tricholoroethane 94% and 6% di-ethylene-dioxide) is well stabilized for cold cleaning operations.

Freon (trichloro-trifluroethane) is the solvent for the flurocarbon. Here we have two of the halogens involved. There are some twelve Freon solvents in which chlorine, fluorine and bromine may occur. Freon compounds may be used to advantage where liquids having nonflammable characteristics are required.

D.N.F. (dimethyl formamide) is not a chlorinated hydrocarbon, although it is a powerful solvent for a wide variety of materials. It has a threshold limit value of 20 ppm and should be used under controlled conditions at all times.

Trichloroethylene and perchloroethylene are two of the least toxic chlorinated solvents and find wide use in vapor degreasing operations.

The automobile engine illustrates controlled fire, explosion and toxic hazards. When we use flammable liquids, we may inadvertently set up uncontrolled carburetors and ignition systems. Proper maintenance involves understanding and detuning or eliminating these crude carburetors and sources of ignition. With proper understanding many of the above-mentioned factors contribute to smooth and safe performance.

● NATIONAL SAFETY COUNCIL AWARD NOTIFICATIONS

Granite City Army Depot has qualified for a NSC Award of Merit for operating 1,028,506 man-hours without a disabling injury from 5 July 1964 to 30 November 1964.

Seneca Army Depot was notified that it has qualified for a NSC Award of Honor for operating 3,182,727 man-hours without a disabling injury from 1 June 1964 to 31 January 1965.

Pine Bluff Arsenal was awarded the NSC Award of Merit for achieving a superior record of 1,191,850 man-hours without a disabling injury from 10 September 1964 to 28 December 1964.

REFERENCE PUBLICATIONS

DA Circular 55-12, 19 January 1965
Transportation and Travel - Transportation of Radioactive Materials

DA Circular 385-6, 31 March 1965
Safety, Driver Safety Education Course

AR 40-21, 23 December 1964
Medical Service - Medical Aspects of Army Aircraft Accident Investigation

AR 95-1, Change 3, 26 February 1965
Army Aviation - General Provisions

AR 95-2, Change 1, 19 January 1965
Aviation - Flight Regulation for Army Aircraft

AR 385-55, Change 2, 26 February 1965
Safety - Prevention of Motor Vehicle Accidents

AR 700-33, 5 March 1965
Logistics - Cargo Unitization

AMCR 385-16, 1 March 1965
Safety - Bureau of Employees' Compensation and Army Civilian Injury Reports Reconciliation (RCS CSGPA-836 (R1))

DO YOU KNOW?

In order to solve the widely varied problems they constantly encounter, safety personnel at Army Materiel Command installations and activities must make use of a vast store of knowledge. Their most complete source of authoritative specialized information is AMCR 385-224, the AMC Safety Manual. Here are ten questions with which you can check your knowledge of what this publication requires under different circumstances. The correct answers and references appear on pages 35 and 36 .

1. What means of warning should be provided on an Army installation railroad when a 22-foot clearance cannot be obtained for overhead obstacles?

   Answer:

   Reference:

2. Are any items excluded from being carried on lift trucks at all times?

   Answer:

   Reference:

3. What restriction is there relative to shipment of blasting caps from AMC installations?

   Answer:

   Reference:

4. What disposition should be made of unidentifiable explosive material found while preparing ammunitions and explosives for shipment?

   Answer:

   Reference:

5. What temperature restriction is placed upon storage of rockets?

   Answer:

   Reference:

6. When a driven ground rod is used as a part of a lightning protection system, how deep into the earth should it extend?

   Answer:

   Reference:

7. What radius of protection from lightning would a 50-foot mast provide?

   Answer:

   Reference:

8. May first echelon preventive maintenance of materials handling equipment be performed on the docks of explosives operating buildings?

   Answer:

   Reference:

9. How often are electrical resistance tests made on conductive floors?

   Answer:

   Reference:

10. How high should air terminals extend above a vent that is emitting an explosive dust under forced draft?

    Answer:

    Reference:

● MOTION DRAWS EYE TO SAFETY MESSAGE

Safety Division, Picatinny Arsenal

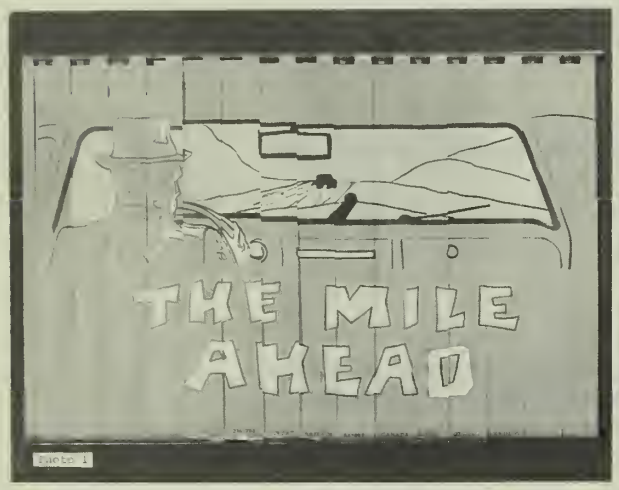
The element of eye-catching motion in its safety displays impresses safety messages into the consciousness of Picatinny Arsenal personnel.

Displays located at carefully chosen spots throughout the Arsenal repeat the same message, which is changed every two weeks. Messages are shown during the same period they are used in safety talk sessions.

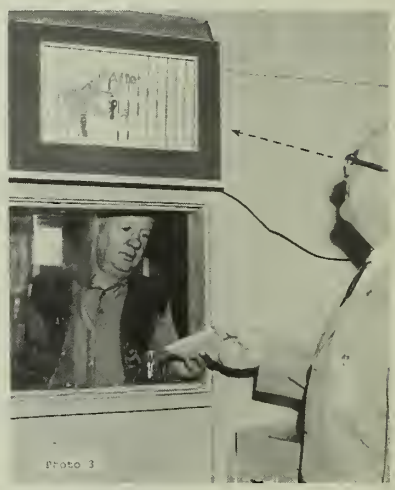
The animated poster effect is obtained through use of a display mounted in 15-pound cabinets. For ease in mounting and message changing, these have hinged top and glass fronts and mounting holes in the back panels. An Underwriters' Laboratories approved low voltage electric motor with a rotating cam is mounted inside on an adjustable bracket. A message cartridge consisting of a housing, message back, front strips, back strips and a wing assembly is inserted in the cabinet in slots on both sides. The cam is seated between the two wings. A standard cool white 24-inch T-12 fluorescent tube provides illumination.

The safety message, printed in color, is composed of front and back strips. The front (even numbered) strips show the first half of the message and the back (odd numbered) the second half. When the cam rotates, the strips move, producing the animation.

The manufacturer of the device provides preprinted standard text cartridges, or will make cartridges with the message that is desired.



Closeup (Photo 1) shows one-half of safety message.



Photos 2 & 3 show animation produced by moving strips.

WELL DID YOU KNOW ?

These are the answers to the questions on pages 32 and 33. All questions were based on information contained in AMCR 385-224, and a reference to the pertinent paragraph follows each answer.

1. Head tappers or telltales should be provided 100 to 200 feet from both sides of the obstacle.

   Reference: Paragraph 2102e, AMCR 385-224.

2. Items such as lunch boxes, newspapers and extra clothing (not being worn), shall not be permitted on lift trucks at any time.

   Reference: Paragraph 2111c, AMCR 385-224.

3. Blasting caps shall not be shipped from AMC installations in the same rail car with any items prohibited by ICC Regulations nor with Classes 2, 2A and 9 (7) explosives.

   Reference: Paragraph 2107j, AMCR 385-224.

4. It should be disposed of by technically trained personnel in accordance with paragraph 2708, AMCR 385-224.

   Reference: Paragraph 2002b, AMCR 385-224.

5. They should not be stored in locations where temperatures exceed 120°F.

   Reference: Paragraph 1825c, AMCR 385-224.

6. A driven ground-rod should extend into the earth for a distance of not less than 10 feet.

   Reference: Paragraph 803g, AMCR 385-224.

7. 100 Feet. The circular base of the "cone of protection" has a radius equal to twice the height of the pole.

   Reference: Paragraph 811c, AMCR 385-224.

8. First echelon preventive maintenance may be performed on noncombustible docks of explosives operating buildings provided the docks are clear of ammunition and explosives.

   Reference: Paragraph 2409, AMCR 385-224.

9. After the initial test has been made, subsequent tests shall be made semiannually.

   Reference: Paragraph 707a, AMCR 385-224.

10. The air terminals should extend not less than 15 feet above the vent opening.

    Reference: Paragraph 803b, AMCR 385-224.

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FLARE

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